

CLAIMS

1. A column spacer for maintaining a gap between two glass substrates at a constant distance in a liquid crystal display element,

which comprises an elastic modulus of 0.2 to 1.0 GPa in compressing by 15% at 25°C.

2. The column spacer according to claim 1, wherein an elastic modulus in compressing by 15% at 60°C is 0.13 to 0.65 GPa.

3. The column spacer according to claim 1, wherein an elastic modulus in compressing by 15% at 120°C is 0.1 to 0.5 GPa.

4. The column spacer according to claim 1, wherein a rate of change of the elastic modulus in the fifth compression relative to the elastic modulus in the first compression is 5% or less when a compression test of compressing by 15% at 25°C is performed repeatedly.

5. The column spacer according to claim 1, wherein an initial compression elastic modulus E_{25} in compressing by 15% at 25°C and a compression elastic modulus E_{120} in compressing by 15% at 25°C after compressing by 15% at 120°C satisfy the relationship of the following equation (1):

$$\{(E_{120}-E_{25})/E_{25}\} \times 100 \leq 10 \quad (1).$$

6. The column spacer according to claim 1, wherein a rate of recovery in deforming by compressing by 15% at 25°C is 70% or more.

7. A liquid crystal display element obtained by

using the column spacer according to claim 1, 2, 3, 4, 5 or 6.

8. A column spacer for maintaining a gap between two glass substrates at a constant distance in a liquid crystal display element,

which comprises a coefficient of linear expansion of 1×10^{-4} to $5 \times 10^{-4}/^{\circ}\text{C}$ at a temperature range of 25 to 100°C .

9. A liquid crystal display element obtained by using the column spacer according to claim 8.

10. A curable resin composition for a column spacer to be used for producing a column spacer of a liquid crystal display element,

which comprises an alkali-soluble high polymer compound having a reactive functional group, a compound having a difunctional or more functional unsaturated bond and a photoreaction initiator.

11. The curable resin composition for column spacers according to claim 10,

wherein an amount of the compound having a difunctional or more functional unsaturated bond to be mixed is 100 to 900 parts by weight with respect to 100 parts by weight of the alkali-soluble high polymer compound having a reactive functional group.

12. The curable resin composition for a column spacer according to claim 10,

wherein the alkali-soluble high polymer compound having a reactive functional group is an alkali-soluble (meth)acrylic copolymer having a (meth)acrylic group and a carboxyl group on a side chain.

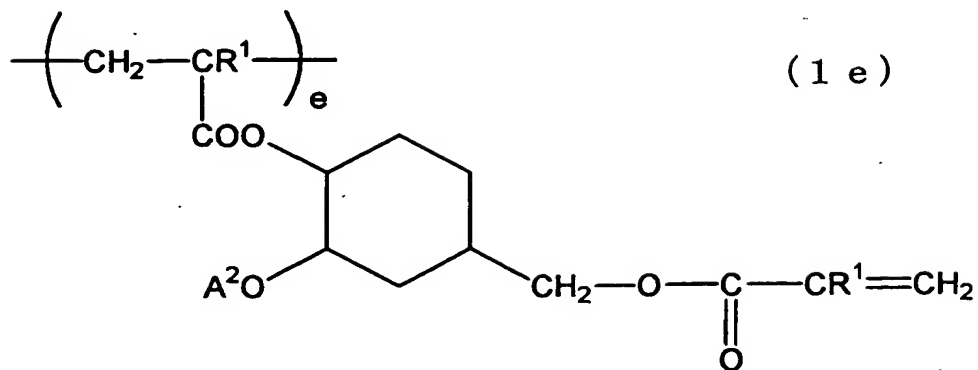
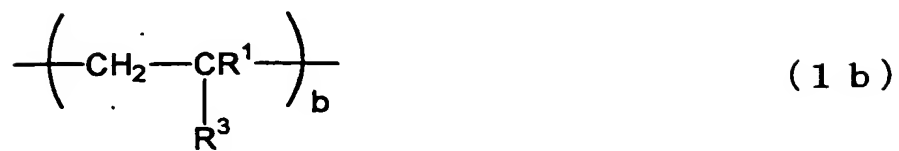
13. The curable resin composition for a column spacer according to claim 12,

5 wherein the alkali-soluble (meth)acrylic copolymer having a (meth)acrylic group and a carboxyl group on a side chain is a polymer having a main chain comprising of at least a constituent unit having an acid functional group and a constituent unit having a hydroxyl group, and a radical polymerizable group-containing isocyanate compound is coupled to at least a part of the acid functional group
10 in the form of an amide bond and/or coupled to at least a part of the hydroxyl group in the form of a urethane bond via an isocyanate group of the isocyanate compound, respectively.

15 14. The curable resin composition for a column spacer according to claim 12,

wherein the alkali-soluble (meth)acrylic copolymer having a (meth)acrylic group and a carboxyl group on a side chain is a copolymer consisting of each structural unit
20 expressed by the following formulas (1a), (1b), (1c), (1d) and (1e);

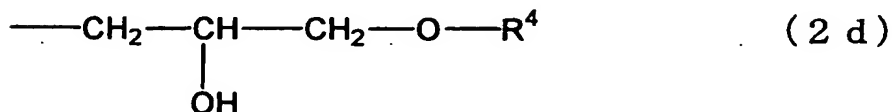
[Chem. 1]



in the formulas (1a), (1b), (1c), (1d) and (1e), A¹ and A²

represent a hydrogen or a following formulas (2a), (2b), (2c) or (2d), and when either of A¹ or A² is a hydrogen, the other is any one of the following formulas (2a), (2b), (2c) and (2d), and R¹ represents a hydrogen and/or a methyl group, R² represents an alkyl group, a phenyl group, a phenyl group containing an alkyl group or an alkoxy group, a hydroxyalkyl group or an alicyclic hydrocarbons, R³ represents a nitrile group or a phenyl group, R⁴ represents an alkyl group, a hydroxyalkyl group or radical polymerizable group-containing aliphatic hydrocarbons, and a, b, c, d and e represent mole ratios (%) of the respective components, and when a+b+c+d+e = 100, a, b and d are 0 to 90, c is 5 to 50 and e is 5 to 60;

[Chem. 2]



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15. The curable resin composition for a column spacer according to claim 14,

wherein A¹ and/or A² is expressed by the formula (2b).

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16. The curable resin composition for a column spacer according to claim 14,

wherein A¹ and/or A² is expressed by the formula (2b) and R⁴ in the formula (2b) is a radical polymerizable group-containing aliphatic hydrocarbon.

17. The curable resin composition for a column spacer according to claim 14,

wherein A¹ and A² are expressed by the formula (2c) or (2d).

18. The curable resin composition for a column spacer according to claim 10,

wherein the alkali-soluble high polymer compound having a reactive functional group is a copolymer containing unsaturated carboxylic acid and/or unsaturated carboxylic anhydride, and a blocked isocyanate group-containing unsaturated compound.

19. The curable resin composition for a column spacer according to claim 18,

wherein the copolymer containing unsaturated carboxylic acid and/or unsaturated carboxylic anhydride, and a blocked isocyanate group-containing unsaturated compound, further contains a hydroxyl group-containing unsaturated compound.

20. The curable resin composition for a column spacer according to claim 10,

wherein the alkali-soluble high polymer compound having a reactive functional group is an alkali-soluble (meth)acrylic copolymer having an epoxy group on a side chain.

21. The curable resin composition for a column

spacer according to claim 10,

wherein the compound having a difunctional or more functional unsaturated bond is a trifunctional or more functional caprolactone modified (meth)acrylate compound.

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22. The curable resin composition for column spacers according to claim 10, wherein the compound having a difunctional or more functional unsaturated bond is a compound having a polymerizable unsaturated bond and having
10 a polyethylene glycol skeleton.

23. The curable resin composition for a column spacer according to claim 10,

which further comprises a thermal cross-linking agent
15 having a functional group capable of doing cross-linking reaction with the alkali-soluble high polymer compound having a reactive functional group.

24. The curable resin composition for column spacers
20 according to claim 23,

wherein the thermal cross-linking agent having a functional group capable of doing cross-linking reaction with the alkali-soluble high polymer compound having a reactive functional group is a thermal cross-linking agent
25 having two or more blocked isocyanate groups.

25. The curable resin composition for a column spacer according to claim 23,

wherein the thermal cross-linking agent having a
30 functional group capable of doing cross-linking reaction with the alkali-soluble high polymer compound having a reactive functional group is a thermal cross-linking agent having two or more epoxy groups.

35 26. A column spacer, obtained by using the curable

resin composition for a column spacer according to claim 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 or 25.

- 5 27. A liquid crystal display element, obtained by using a column spacer according to claim 26.